

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
8 July 2004 (08.07.2004)

PCT

(10) International Publication Number
WO 2004/056988 A3

(51) International Patent Classification⁷: C12N 9/38

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(21) International Application Number:
PCT/DK2003/000851

(22) International Filing Date:
11 December 2003 (11.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2002 01968 20 December 2002 (20.12.2002) DK
PA 2003 00537 8 April 2003 (08.04.2003) DK

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
12 August 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GALACTANASE VARIANTS

(57) Abstract: Variants of Glycoside hydrolase family 53 galactanases having an alteration in at least one position out of a large number of positions. The variants may be used in the dairy industry, for preparation of galacto-oligo-saccharides or for hydrolysis of lactose, and may be derived from strains of *Yersinia*, *Aspergillus*, *Humicola*, *Meripilus*, *Myceliophthora*, *Thermomyces*, *Bacillus*, *Bifidobacterium*, *Cellvibrio*, *Clostridium*, *Pseudomonas*, *Thermotoga*, or *Xanthomonas*.

WO 2004/056988 A3

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 C12N9/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

BIOSIS, WPI Data, MEDLINE, EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	LE NOURS JEROME ET AL: "Structure of two fungal beta-1,4-galactanases: Searching for the basis for temperature and pH optimum." PROTEIN SCIENCE, vol. 12, no. 6, June 2003 (2003-06), pages 1195-1204, XP002279558 ISSN: 0961-8368 the whole document --- -/--	1-28

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

11 May 2004

Date of mailing of the international search report

03. 06. 2004

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/DK 03/60851

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>DATABASE WPI Section Ch, Week 200375 Derwent Publications Ltd., London, GB; Class B04, AN 2003-793294 XP002279562 & JP 2003 174892 A (DOKURITSU GYOSEI HOJIN SANGYO GIJUTSU SO), 24 June 2003 (2003-06-24) abstract</p> <p>---</p>	1-28
X	<p>RYTTERSGAARD C ET AL: "Crystallization and preliminary X-ray studies of beta-1,4-galactanase from Aspergillus aculeatus" ACTA CRYSTALLOGRAPHICA SECTION D BIOLOGICAL CRYSTALLOGRAPHY, vol. 55, no. 4, April 1999 (1999-04), pages 929-930, XP002279559 ISSN: 0907-4449 cited in the application the whole document</p> <p>---</p>	1-28
X	<p>BRAITHWAITE K L ET AL: "Evidence that galactanase A from Pseudomonas fluorescens subspecies cellulosa is a retaining family 53 glycosyl hydrolase in which E161 and E270 are the catalytic residues." BIOCHEMISTRY. UNITED STATES 9 DEC 1997, vol. 36, no. 49, 9 December 1997 (1997-12-09), pages 15489-15500, XP002279560 ISSN: 0006-2960 abstract</p> <p>---</p>	1-28
P,X	<p>RYTTERSGAARD CARSTEN ET AL: "Aspergillus aculeatus beta-1,4-galactanase: Substrate recognition and relations to other glycoside hydrolases in clan GH-A." BIOCHEMISTRY, vol. 41, no. 51, 24 December 2002 (2002-12-24), pages 15135-15143, XP002279561 ISSN: 0006-2960 (ISSN print) the whole document</p> <p>---</p>	1-28
X	<p>WO 97 32014 A (KAUPPINEN MARKUS SAKARI ;NOVONORDISK AS (DK); ANDERSEN LENE NONBOE) 4 September 1997 (1997-09-04) cited in the application claims</p> <p>---</p>	1-28
X	<p>WO 00 47711 A (NOVONORDISK AS) 17 August 2000 (2000-08-17) cited in the application claims</p> <p>-----</p>	1-28

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat I Applicat
PCT/DK 03/00851

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2003174892 A	24-06-2003	NONE	
WO 9732014 A	04-09-1997	AU 727785 B2	21-12-2000
		AU 2090997 A	16-09-1997
		CA 2246732 A1	04-09-1997
		CN 1212011 A	24-03-1999
		WO 9732014 A1	04-09-1997
		EP 0885296 A1	23-12-1998
		JP 2000505303 T	09-05-2000
		US 6242237 B1	05-06-2001
		US 6485954 B1	26-11-2002
WO 0047711 A	17-08-2000	AU 2535600 A	29-08-2000
		WO 0047711 A2	17-08-2000
		US 6331426 B1	18-12-2001